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REPORT

CD NO.

50X1-HUM

COUNTRY	USSR	DATE OF INFORMATION	1950
SUBJECT	Scientific - Radio, insulators	DATE DIST.	13 Jan 1951
HOW PUBLISHED	Monthly periodical		
WHERE PUBLISHED	Moscow	NO. OF PAGES	3
DATE PUBLISHED	Mar 1950	SUPPLEMENT TO REPORT NO.	
LANGUAGE	Russian		

THIS IS UNEVALUATED INFORMATION

SOURCE Radio, No 3, 1950, pp 35-36, [redacted]

50X1-HUM

METALLIC INSULATORS

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/The first part of this article, together with Figures 1 and 2, here omitted, deals with elementary theory of "long lines" showing how standing waves will be created in the case of both an open and short-circuited line. It is then shown that a quarter-wave line is analogous to an LC series circuit (when open) and to an LC parallel circuit (when short-circuited). Figures referred to in following text are appended./

These properties of a quarter-wave length are finding wide application in various practical cases. Since a quarter-wave line short-circuited at one end has infinitely high resistance at the other (input) end, connecting it with another two-wire line will not disturb the operating conditions of this line. This circumstance makes it possible to use the line as a "metallic insulator." The use of a quarter-wave line as a filter for even harmonics is based on the fact that for the 2d harmonic (and in general, any even harmonic) the input resistance of the line is equal to zero.

Figure 3 shows the simplest method of using a metallic insulator. Connecting the short-circuited quarter-wave section C does not disturb the operating conditions of line AB.

Figure 4a shows how to brace a two-wire line at a given height by means of metal insulating supports. This system is equivalent to supporting the line on conventional insulators (Figure 4b), but the "quality" of the metallic insulators is incomparably higher, since there are practically no losses. Quarter-wave metallic insulators consume practically no energy. Their insulating properties deteriorate greatly if the frequency deviates from the magnitude for which the insulator is intended, since its length ceases to be equal to a quarter-wave length.

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But this property of metallic insulators can be successfully applied in certain cases, for example, in a filter which absorbs the odd harmonics of the current in a line and permits its even harmonics to pass freely. This type of filter is used in the cathode circuit of a uhf generator.

Figure 5a gives an instance of the use of quarter-wave length line -- short-circuited and open -- as a filter. Here the short-circuited section of the line can function simultaneously as a metallic insulating support since it has infinite resistance at the basic frequency and does not affect the antenna input; but its resistance is zero for the even harmonics and, consequently, they do not enter the antenna -- a filter, connected to points a and b short-circuits them.

An open quarter-wave line connected at points c and d can also function as a variant of the filter. For the basic frequency the resistance of the open section c and d is zero (short circuit), and the antenna supply is not affected. However, for even harmonics the resistance of the section c and d will be infinity and, as in the previous case, they will not enter the antenna.

Instead of a two-wire line, a coaxial line is often used, consisting of an outer tube A and an inner conductor B. A line of this type has many advantages over a two-wire line. Figure 5b shows a section of such a line in which a quarter-wave line C acts as a metallic insulating support.

/Figures are appended./

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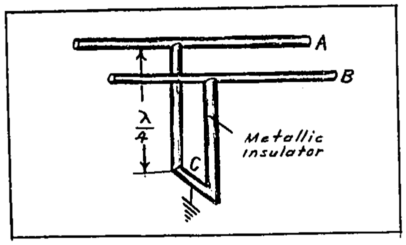

Figure 3

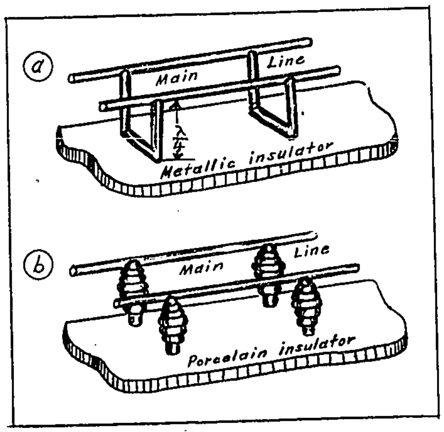

Figure 4

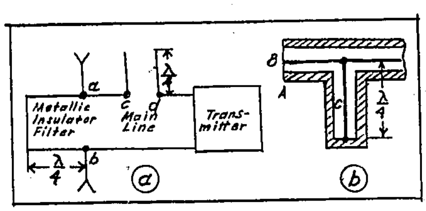

Figure 5

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